

APPROVED BY

Director of Power Engineering

School

 A.S. Matveev

«30» 06 2020

**SYLLABUS FOR**  
**“QUALITY OF ELECTRIC ENERGY IN ELECTRICAL SUPPLY SYSTEMS”**

**Field of study:** 13.04.02 "Electric Power and Electrical Engineering"

**Program name:** "Electric Generation and Transportation"

**Level of study:** Master

**Year of admission:** 2019

**Semester, year:** semester - 2; 2020.

**ECTS:** 4

**Total Hours:** 144

**Contact Hours:** 48


- **Lectures:** 8
- **Labs:** 16
- **Practical experience:** 24

**Assessment:** credit-test


**Type of intermediate certification:** no

**Department:** Division for Power and Electrical Engineering

**Head of Division:**

 Ivaschutenko A.S.

**Instructor:**

 Surkov M.A.

**2020**

<b>Course Objectives</b>	<p>Formation of knowledge and skills in the field of calculation and design of power supply systems based on renewable energy sources are the main objectives of the discipline for students.</p> <p>Objectives O1, O3 and O5 of basic educational program (BEP) “Electric Power and Electrical Engineering” will be reached as a result of learning this discipline. Achieved knowledge, skills and experience will prepare the student for:</p> <ul style="list-style-type: none"><li>• design and engineering activity in the field of electro energy and electro technic and to be able to choose modern equipment, design new world competitive electro technical objects, systems and units using modern automated design soft, to be able evaluate technical and economical effectiveness (O1);</li><li>• scientific and research activity including interdisciplinary areas such as mathematical modeling of processes and objects, to be able to do experimental research and analysis of the results, design of innovation methods increasing effectiveness of designing and operation of electrical energy systems and objects (O3);</li><li>• self-education and learning new skills for career realization and development (O5).</li></ul>						
<b>Learning Outcomes</b>	According to the requirements of BEP and Federal Government Educational Standard (FGES) studying the discipline “Advanced topics of power supply” is focused on formation among the students next competences (see table 1):						
	Constituents of the learning outcomes						
	Learning Outcome s	Learning outcomes components					
		Code	Knowledge	Cod e	Skills	Code	Experience
LO 1	K 1.2	allocates and systematizes the main ideas in scientific texts and educational publications that contribute to solving the problem	S 1.1	Allocate and justify anthropocentric criteria on the basis of which decision models are formed	E1.2	methods and principles for the collection and analysis of factual material from various sources	
	K 1.3	formulates anthropocentric decision-making models, methods decisions and justification Criteria	S 1.6	to apply psychological-pedagogical and didactic knowledge in practical activity	E1.4	methods and means of cognition, self-study and self-control	



	<p>and Transportation”, “Optimization of power supply systems”, “Renewable Energy Sources”.</p> <p>This discipline is one of the major, it is autonomous and also could be a base for special disciplines. It consist of next parts:</p> <ul style="list-style-type: none"> <li>• Reactive power;</li> <li>• Relations of energy supplier and consumer at the field of generation and consumption of reactive power;</li> <li>• Reactive power sources at industrial enterprises;</li> <li>• Consumption of reactive power at industrial enterprises;</li> <li>• Transverse compensation of reactive power;</li> <li>• Longitudinal compensation of reactive power;</li> <li>• Technical and economical calculations of compensation of reactive power.</li> </ul>
<b>Prerequisites</b>	<p><b>Prerequisites</b> of this discipline are: “Computer, network and information technologies”, “Emergency control in power systems”</p> <p><b>Corequisites:</b> “Integration of renewable energy systems into power supply systems”, “Special issues of electricity supply”.</p>
<b>Facilities and Equipment</b>	<ul style="list-style-type: none"> <li>• Laboratory of the special course on power supply - Building 8, room 245, 5 units;</li> </ul>
<b>Grading Policy</b>	<p>Assessment of the quality of the discipline in the course of the current and intermediate certification of students is carried out in accordance with the Regulations for the Intermediate Attestation of Students of the Tomsk Polytechnic University.</p> <p>The maximum score for the discipline in the semester is 100 points, including:</p> <ul style="list-style-type: none"> <li>• within the current control - 100 points,</li> </ul> <p>Assessment of the quality of the discipline is based on the results of evaluation activities.</p> <p>Evaluation activities of the current monitoring by sections and types of educational activities are given in the Appendix "Calendar rating-plan for studying discipline (module)".</p>
<b>Course Policy</b>	<p>Class attendance will be taken into consideration when evaluating students` participation in the course. Students are expected to actively engage in class discussions about the assigned readings. Attendance is strictly controlled and all class is obligatory to presence.</p>
<b>Teaching Aids and Resources</b>	<p><b>Main literature.</b></p> <ol style="list-style-type: none"> <li>1. Voropay N.I. Reliability of power supply systems: textbook / NI Voropai; Irkutsk National Research Technical University (IRNITU); Amur State University (AmSU); Russian Academy of Sciences (RAS), Siberian Branch (SO), Institute of Power Systems named after. L. A. Melentieva (ISEM). - 2 nd ed., Pererab, and additional. - Novosibirsk: Science, 2015. - 208 pp. - ISBN 978-5-02-019201-0;</li> <li>2. Vasilieva TN. Reliability of electrical equipment and power supply systems / TN Vasil'eva. - Moscow: Hotline-Telecom, 2015. - 152 p .: Ill .. - Bibliography: p. 145-150. - ISBN 978-5-9912-0468-2;</li> <li>3. Control and analysis of the quality of electrical energy in general-purpose power supply systems: a collection of documents. - Moscow: Alvis, 2013. - 122 p .: ill .. - Normative documents. - ISBN 978-5-904098-36-0.</li> </ol> <p><b>Additional literature:</b></p> <ol style="list-style-type: none"> <li>4. GOST 13109-97 "Norms of quality of electric energy in general-purpose</li> </ol>

	<p>power supply systems".</p> <ol style="list-style-type: none"> <li>5. Volkov, N.G. Quality of electricity in power supply systems: a textbook / NG Volkov; National Research Tomsk Polytechnic University (TPU). - Tomsk: Publishing house TPU, 2010. - 152 p. : il .. - Bibliograf. from. 149</li> <li>6. Lukutin BV The quality of electrical energy. Laboratory workshop: a textbook for universities / B. V. Lukutin, I. O. Muravlev, A. A. Muravlev; National Research Tomsk Polytechnic University (TPU). - Tomsk: Publishing house TPU, 2010. - 87 p. : il .. - Bibliograf. from. 83 ..</li> <li>7. G.N. Klimova, A.V. Kabyshev. Elements of energy saving in power supply of industrial enterprises: textbook / GN Klimova, AV Kabyshev; Tomsk Polytechnic University (TPU). - Tomsk: Publishing house TPU, 2008. - 187 p. : il .. - Textbooks of Tomsk Polytechnic University. - Bibliographic list: p. 142.</li> <li>8. Kalyavin, V.P. Reliability and diagnostics of electrical installation elements: a manual / VP Kalyavin, LM Rybakov. - St. Petersburg. Elmore, 2009. - 336 p. : il .. - Bibliograf. from. 326-327. - ISBN 5-7399-0150-2.</li> <li>9. A. Cusco, Alexander. Power supply networks. Methods and means of energy quality assurance: Per. with English. / A. Cusco, M. Thompson. - Moscow: Dodeca-XXI, 2010. - 334 p. : il .. - Bibliography at the end of chapters. - Subject index: with. 331-333. - ISBN 978-5-94120-226-3.</li> </ol> <p><b>Information support</b></p> <p>Internet resources (including LMS MOODLE and other educational and library resources):</p> <ol style="list-style-type: none"> <li>10. Lukutin B. V. The quality of power supply to industrial consumers: textbook [Electronic resource] / BV Lukutin IO Muravlev, AA Muravlev; National Research Tomsk Polytechnic University (TPU). - 1 computer file (pdf; 4.8 MB). - Tomsk: Publisher TPU, 2014. - Title from the title screen. - Access from the corporate network of TPU. - System requirements: Access scheme: <a href="http://www.lib.tpu.ru/fulltext2/m/2014/m315.pdf">http://www.lib.tpu.ru/fulltext2/m/2014/m315.pdf</a></li> </ol>
<b>Instructor</b>	Surkov Mikhail Alexandrovich, <a href="mailto:masur@tpu.ru">masur@tpu.ru</a>